

URC RESEARCH REPORT

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Project Title: Design for an energy regeneration system with an air motor in a golf cart

1. What is(are) the research question(s)?

The most significant challenge of commercializing an electric car (or hybrid car with electric and gasoline engine) is the capability of recharging and maintaining its battery's longevity. At the same time, the battery has a limitation on its capability of instant power output e.g. the car in an overtaking manoeuvre. Since compressed air is a clean energy, is it possible for regenerating energy from motion using compressed air in an electric car as an additional power source? This research had confirmed that the compressed air in an electric car is suitable for regenerating energy from motion and being used as additional power source.

2. Rationale

As oil price and environmental issues are the hotspots recently, current commercialized cars have been intended to reduce oil consumption and also using regeneration of energy. An electric car is considered the most potential replacement of petrol and diesel engine cars since electric power can be generated from clean power plants e.g. Wind turbine power stations. The existing technology of a battery has the advantage of storing and regenerating energy. However, the most significant challenge of commercializing an electric car is the capability of recharging its battery. Frequent recharge to a battery can reduce the life of the battery. In the meantime, the efficiency of recharge to a battery is very low.

An additional challenge of using a battery is the limitation on the capability of instant power output e.g. the car in overtaking manoeuvre. Therefore, the predominant design of a commercialized electric car not only uses a battery but also uses petrol or a diesel engine (Known as a hybrid car). Since compressed air is a clean energy, this research will aim to regenerate energy from motion using compressed air in an electric car instead of using petrol or a diesel engine.

3. Methodology

This project is to confirm a novel method at regeneration of energy of motion with compressed air.

A golf cart is selected for an experiment since the golf cart is driven by electric power and additional power is essential during acceleration. Data is collected and compared under the same road condition e.g. in a suitable test site during an equal period of time using

1. A golf cart without a compressed air regeneration system, and
2. A golf cart with a compressed air regeneration system.

The data is analysed and a conclusion is reached to enable a working model of a commercialized hybrid electric car using a compressed air system.

4. Outcomes / findings

This research had confirmed that the compressed air in an electric car is suitable for regenerating energy from motion and being used as additional power source. Additional finding is that the regenerative rate can be between 5%-12% in a normal road condition. While it is in downhill, the regenerative rate reaches as much as 80%. Publications on the processing and results in this project are available for 2009. In order to commercialize this project, industry supports are needed.

5. Publications and dissemination

- An abstract "Pneumatic re-generation system in an electric car" for a full refereed paper submitted to The sixteenth annual Conference on Mechatronics and Machine Vision in Practice, Brunei, December 8 - 10, 2009 <http://www.m2vip.com/>
- An interview on this research topic by a reporter from New Zealand Herald on Sunday will be held on following 2 weeks.
- "Compressed air hybrid vehicle", Advance Magazine of Innovation and Research Winter 2009
- A Master of Design thesis on this topic by student Vivien Liang will be submitted in later 2009 (under supervision by the researches in this project: Dr. David Hawkins & Dr. Tom Qi).

6. Financial reconciliation

Please see Appendix - Income & Expenditure Report.